

SMP Bladder Tooling for Manufacturing Composites, Phase I

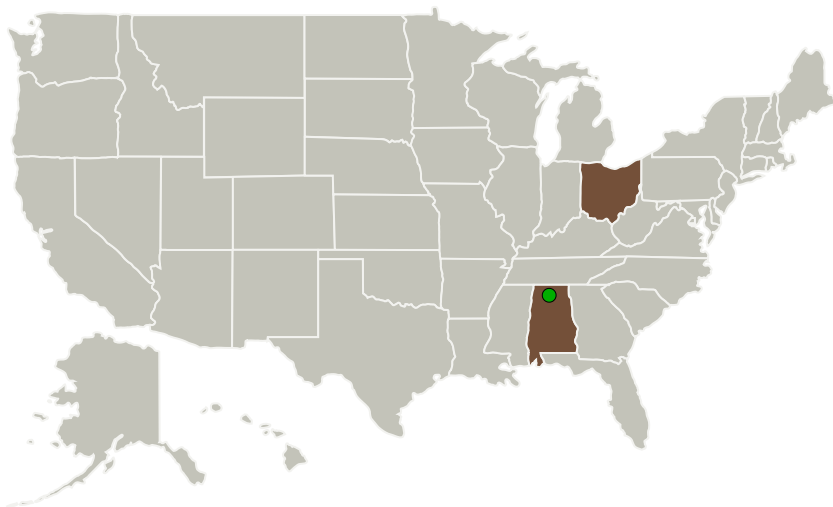
Completed Technology Project (2010 - 2010)



Project Introduction

CRG's shape memory polymer (SMP) Bladder Tooling is a cutting-edge manufacturing technology that can meet the manufacturing needs of the Ares launch vehicles. This process provides labor savings, weight reductions, and reliable manufacturing results for fabricating complex composites. SMP bladder tooling eliminates the transferring process by operating as both a rigid lay-up mandrel and an elastic bladder. Initially, the tooling is a rigid, durable surface for composite lay-up, then when heated during the cure cycle the tooling transitions to a flexible bladder to provide consolidation force. The tooling can then be easily removed from the cured composite while in the elastic state, reformed, and reused for the next part. In addition to increased part quality, SMP bladder tooling can present a significant cost reduction over current manufacturing processes. When comparing SMP bladder tooling with a silicone bladder over a foam insert for manufacturing of an Environmental Control System (ECS) duct, there is a 46% savings over the first three parts and 80% savings over twelve parts. A second cost saving example is the comparison of SMP bladder tooling with washout tooling for the same ECS duct. Cost saving for the first three parts is 40% and 79% over twelve parts.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Cornerstone Research Group, Inc.	Lead Organization	Industry	Miamisburg, Ohio
● Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Ohio

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140646>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Cornerstone Research Group, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

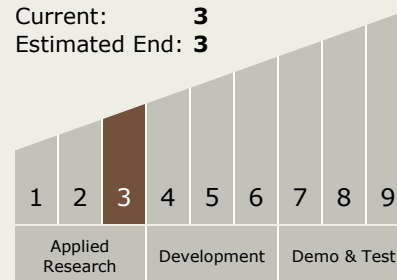
Joel Everhart

Technology Maturity (TRL)

Start: **3**

Current: **3**

Estimated End: **3**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.2 Intelligent Integrated Manufacturing

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System